Anomalous origin of left coronary artery from pulmonary artery — Duped by 2D; saved by color Doppler: Echocardiographic lesson from two cases

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ABSTRACT

Echocardiography is an important first-line investigation for detection of anomalous origin of a coronary artery from the pulmonary artery (ALCAPA). We report two cases of ALCAPA that illustrate the importance of systematic performance of the echocardiogram, mindful of technical artifacts that may mislead the echocardiographer color Doppler imaging in diagnosis of this condition.

Keywords: ALCAPA, color Doppler, echocardiogram

CASE REPORT

Echocardiography is the screening imaging tool for diagnosis of anomalous origin of left coronary artery from pulmonary artery (ALCAPA). We present two cases (1 year old and 10 year old, respectively) where the 2-dimensional (2D) echocardiographic images showed an apparent origin of left coronary artery (LCA) from aorta due to a drop-out artifact [Figures 1a and 3a]. However, color Doppler in diastole showed blue signal [Figures 1b and 3b] suggestive of flow towards the aorta. This abnormal color Doppler signal prompted angiography in both patients that confirmed the diagnosis of ALCAPA [Figures 2 and 4]. Case 1 [Figures 1 and 2] is a 1-year-old baby girl who presented as "dilated cardiomyopathy" with moderate left ventricle (LV) systolic dysfunction. Case 2 [Figures 2 and 4] is a 10-year boy who presented with chest pain on exertion and had normal LV systolic function. Both patients underwent surgical repair with good outcome. Figure 5 illustrates the mechanism by which the apparent drop-out may occur. This tissue separation between the coronary artery and aortic lumen may be "dropped" when the tissue is parallel to the beams of ultrasound shown by dotted lines in Figure 5. These two cases illustrate the importance of evaluating coronary arteries both by 2D and color Doppler images.

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Quick Response Code:

Website: www.annalspc.com

DOI: 10.4103/0974-2069.140862

DISCUSSION

This phenomenon has been well described in literature.[1-4]

1. Artifactual "drop-out" at coronary origin in the 2D images as we described above — in spite of

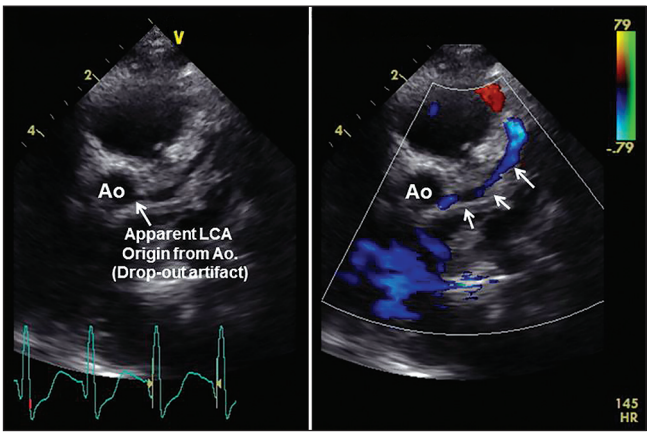

Figure 1: Echocardiogram in parasternal short-axis view from case 1 (10 month old). Panel 1A shows 2D image of aortic root in cross-section with apparent origin of left coronary artery (LCA) from aorta. Arrow points to area of "drop-out" artifact. Panel 1B shows color Doppler imaging of the same area. Blue color indicates reversed direction of flow in left coronary artery (arrows) which is abnormal

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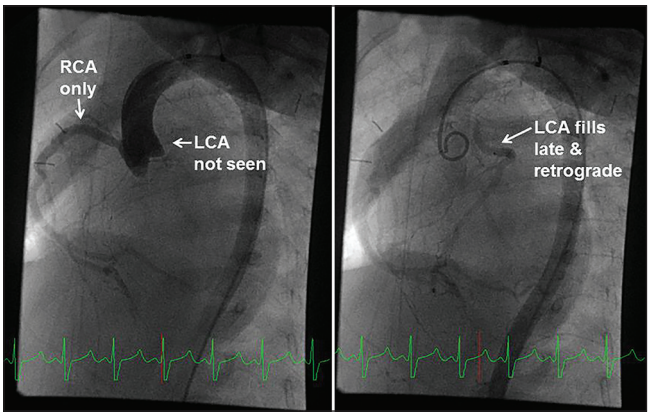

Figure 2: Aortogram in lateral view from case 1. Panel 2A is a freeze frame early during the angiogram, showing that only right coronary artery (RCA) originates from aorta. It is notable that left coronary artery (LCA) is not seen in this image. Panel 2B is a freeze frame later during the angiogram, showing LCA filling late and retrograde by collateral branches from right coronary artery. LCA empties into main pulmonary artery, consistent with the diagnosis of anomalous origin of a coronary artery from the pulmonary artery (ALCAPA)

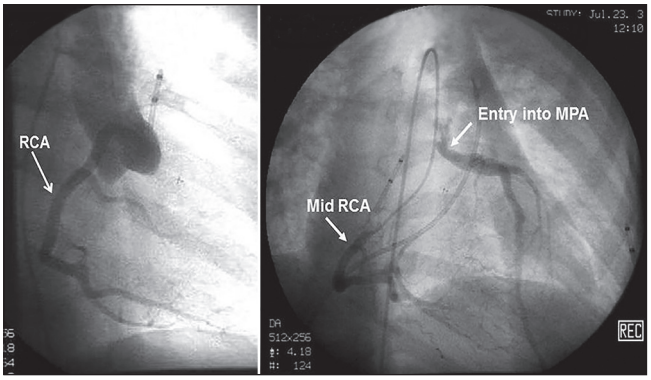

Figure 4: Angiograms confirming diagnosis of anomalous origin of a coronary artery from the pulmonary artery (ALCAPA) in case 2 (14 year old). Panel 4A is right anterior oblique view of aortogram showing only right coronary artery (RCA) originates from aorta. Left coronary artery is not originating from aorta. Panel 4B is selective right coronary artery angiogram in right anterior oblique view showing retrograde filling of left coronary artery via collateral branches from RCA. Left coronary artery empties into main pulmonary artery (MPA)

optimized probe position and gain setting on the echocardiography machine or

2. Transverse sinus of pericardium presenting as an echo-free linear space that is mistaken for a coronary artery origin in parasternal short axis view.[2]

This misleading finding in 2D images may be overcome by repositioning the ultrasound transducer to a more angular vantage point in the chest, optimizing Doppler scale settings and awareness of transverse pericardial sinus anatomy. When the color signal is abnormal, the echocardiographer should pursue to demonstrate other indirect signs such as abnormal flow into the main pulmonary artery, dilatation of the opposite coronary artery and evidence of collateral flow.

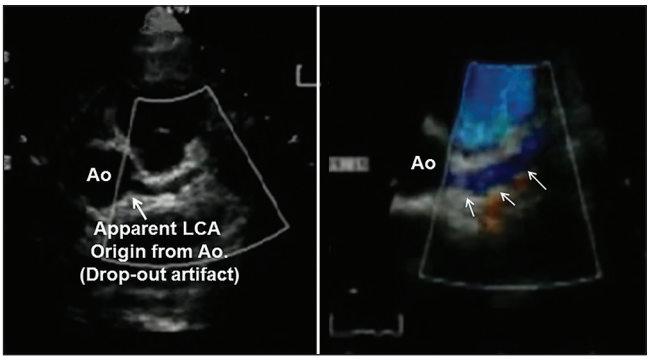

Figure 3: Echocardiogram in parasternal short-axis view from case 2 (14 year old). Panel 3A shows 2D image of aortic root in cross-section with apparent origin of left coronary artery (LCA) from aorta. Arrow points to area of "drop-out" artifact. Panel 3B shows color Doppler imaging of the same area. Blue color indicates reversed direction of flow in left coronary artery (arrows) which is abnormal

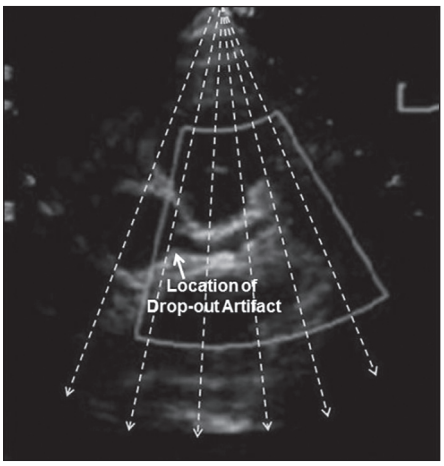

Figure 5: Cartoon illustrating the direction of ultrasonic waves (interrupted lines), parallel to the tissue separating aortic lumen from coronary artery lumen. Arrow shows the location of "drop-out" artifact, creating an apparent appearance of left coronary artery originating from aorta

CONCLUSION

Coronary artery evaluation by echocardiogram should be performed systematically in all patients using both 2D and color Doppler as a routine. This will ensure acquisition of necessary skills by the echocardiographer and the physician.

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How to cite this article: Yarrabolu TR, Ozcelik N, Quinones J, Brown MD, Balaguru D. Anomalous origin of left coronary artery from pulmonary artery - Duped by 2D; saved by color Doppler: Echocardiographic lesson from two cases. Ann Pediatr Card 2014;7:230-2.

Source of Support: Nil, **Conflict of Interest:** None declared